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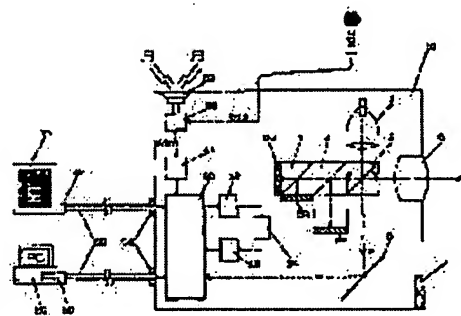
(72)Inventor : ARIMA HIROFUMI

(54) PROJECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To effectively utilize a P polarized light wave, which is abandoned after passage through a polarized light beam splitter, by arranging a mirror on the optical path of straight advancing light (P polarized light wave), modulating P polarized light reflected there with audio signals or data signals and outputting them.

SOLUTION: The straight advancing light (P polarized light) emitted from a light source 1 and transmitted through a polarized light beam splitter 2 is reflected by a mirror 8 on the optical path and guided to an optical transmission block 20. This light is not utilized as excessive light but concerning this projector, in the case of outputting a sound to the outside, this excessive light is utilized. Namely, an amplified audio signal 61d is inputted through a DMD driving circuit 11 to the light transmission block 20. In this case, one part of light (straight advancing light passed through the polarized light beam splitter 2) inputted to the optical transmission block is used and sent outside a projector casing 10. The sent-out optical signal is optically transmitted through an optical fiber 90 to a photoelectric converting module 40 for reception and dispatched to an external amplifier 70.



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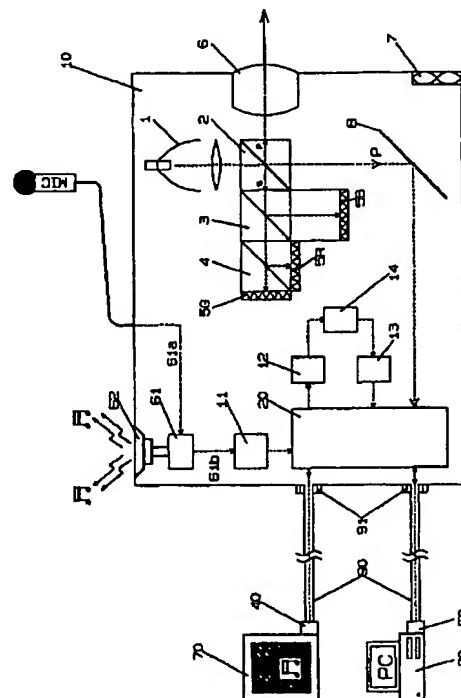
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(54) 【発明の名称】 プロジェクタ

(57) 【要約】

【課題】 反射型の液晶プロジェクタにおいて、従来、偏光ビームスプリッタで2分される光のうち反射光のみが投影に寄与し、直進光は廃棄されている。この熱量は相当な量で、大がかりな冷却ファンが必要である。また、プロジェクタを遠隔制御するリモコンは乾電池が使用されており、無駄なスペースと、乾電池交換の手間や維持費が必要である。本発明はこのような従来の問題点に鑑みてなされたもので、従来廃棄されていた直進光を有効利用するプロジェクタを提供する。

【解決手段】 光源から出た白色光が偏光ビームスプリッタによって2分された光のうち、映像に寄与しない直進光(P偏光)を光変調素子で音声信号やデータ信号で変調し出力する構成にした。受信は、無変調の偏光光を機器に射出し、その機器で音声信号やデータ信号で変調して送り返し、その信号を受光素子で受信する構成とした。さらに余剰光太陽電池を装備したリモコン内に蓄えて電力源として利用する。



【特許請求の範囲】

【請求項 1】光源と、前記光源からの光を S 偏光光と P 偏光光とに分岐する偏光光分岐手段を有するプロジェクタにおいて、前記偏光光分岐手段にて分岐された前記 S 偏光光と前記 P 偏光光のうち投影に使用されない側の偏光光の到達先に配置され、前記プロジェクタの筐体の外部から与えられる音声信号もしくはデータ信号に応じて前記偏光光を変調し、変調偏光光を生成する光変調手段と、前記変調偏光光を外部に出力する変調偏光光出力手段と、を有することを特徴とするプロジェクタ。

【請求項 2】光源と、前記光源からの光を S 偏光光と P 偏光光とに分岐する偏光光分岐手段を有するプロジェクタにおいて、前記偏光光分岐手段にて分岐された前記 S 偏光光と前記 P 偏光光のうち投影に使用されない側の偏光光の到達先に配置され、前記偏光光を無変調のまま外部に出力する無変調偏光光出力手段と、を有することを特徴とするプロジェクタ。

【請求項 3】光源と、前記光源からの光を S 偏光光と P 偏光光とに分岐する偏光光分岐手段を有するプロジェクタにおいて、前記偏光光分岐手段にて分岐された前記 S 偏光光と前記 P 偏光光のうち投影に使用されない側の偏光光の到達先に配置され、前記偏光光を無変調のまま外部に出力する無変調偏光光出力手段と、外部の機器等により与えられる音声信号もしくはデータ信号によって前記無変調のまま外部に出力された偏光光が変調を受け、変調された S 偏光光、もしくは変調された P 偏光光を前記プロジェクタに入力する変調偏光光入力手段と、前記変調偏光光入力手段で入力された、前記変調された S 偏光光もしくは、前記変調された P 偏光光を電気信号に変換する受光素子と、を有することを特徴とするプロジェクタ。

【請求項 4】光源と、前記光源からの光を S 偏光光と P 偏光光とに分岐する偏光光分岐手段を有するプロジェクタにおいて、前記偏光光分岐手段にて分岐された前記 S 偏光光と前記 P 偏光光のうち投影に使用されない側の偏光光の到達先に配置され、前記偏光光を、赤、緑、青の各色光に分離する色分解手段と、外部から与えられる音声信号もしくはデータ信号に応じて前記各色光のうちの 1 つを変調し、変調偏光光とする光変調手段と、前記変調偏光光を、前記プロジェクタの筐体の外部へ出力する変調偏光光出力手段と、を有することを特徴とするプロジェクタ。

【請求項 5】請求項 3 に記載のプロジェクタにおいて、前記無変調偏光光出力手段と前記変調偏光光入力手段は共通の部材で構成されることを特徴とするプロジェクタ。

【請求項 6】請求項 5 に記載のプロジェクタにおいて、前記共通の部材とは光伝送部材で構成されることを特徴とするプロジェクタ。

【請求項 7】請求項 6 に記載のプロジェクタにおいて、

前記光伝送部材は光ファイバーを有することを特徴とするプロジェクタ。

【請求項 8】請求項 1 から請求項 4 のいずれに記載のプロジェクタにおいて、前記偏光光分岐手段は、偏光ビームスプリッタを有することを特徴とするプロジェクタ。

【請求項 9】請求項 1 または請求項 4 に記載のプロジェクタにおいて、前記光変調手段はデジタルマイクロミラーデバイスを有することを特徴とするプロジェクタ。

【請求項 10】請求項 1 または請求項 4 に記載のプロジェクタにおいて、前記光変調手段は透過型液晶パネルを有することを特徴とするプロジェクタ。

【請求項 11】請求項 4 に記載のプロジェクタにおいて、前記色分解手段は、ダイクロイックミラーを有することを特徴とするプロジェクタ。

【請求項 12】請求項 2 に記載のプロジェクタにおいて、前記プロジェクタは、前記プロジェクタを操作するリモートコントローラーを備え、前記リモートコントローラーは太陽電池と、前記太陽電池から生み出される電力を蓄積する手段を備え、前記太陽電池は前記出力光を充電光とし、前記蓄積手段に電力を蓄積する事を特徴としたプロジェクタ。

【請求項 13】請求項 12 に記載のプロジェクタにおいて、前記リモートコントローラーは、前記プロジェクタの筐体を開けた前記出力光の出口の位置に、着脱可能な固定部材で装着される事を特徴としたプロジェクタ。

【請求項 14】請求項 2 または請求項 3 に記載のプロジェクタにおいて、前記無変調偏光光出力手段は、前記プロジェクタの筐体から光りを漏らさないシャッターを備えたことを特徴とするプロジェクタ。

【請求項 15】請求項 1 または請求項 4 に記載のプロジェクタにおいて、前記変調偏光光出力手段は、前記プロジェクタの筐体から光りを漏らさないシャッターを備えたことを特徴とするプロジェクタ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、プロジェクタに関する。

【0002】

【従来の技術】従来、光源から光を液晶パネルに照射して、液晶パネルからの反射光をスクリーン上に投影する反射型の液晶プロジェクタが知られている。従来のプロジェクタの構成を図 6 に示す。図 6 において、光源 1 の照射方向には、照明光学系 9 を介して偏光ビームスプリッタ 2 が配置される。これにより白色光が偏光方向が互いに直交する 2 つの直線偏光光すなわち、P 偏光波（直進光）と S 偏光波（反射光）に 2 分される。ちなみに、石黒浩三著「光学」によれば、S 偏光、P 偏光の S、P は、Senkrecht（垂直）、Parallel（平行）の頭文字である。

【0003】反射光（S 偏光波）の到達先には、赤、

緑、青の各色光にダイクロイックミラー 3、4 が配置されている。ダイクロイックミラー 3 における青色成分 (B) の反射方向には、B 用液晶パネル 5 B が配置される。ダイクロイックミラー 3 の透過方向で、ダイクロイックミラー 4 における赤色成分 (R) の反射方向には、R 用液晶パネル 5 R が配置され、また、ダイクロイックミラー 3、4 の透過方向には、緑成分 (G) の G 用液晶パネル 5 G が配置される。これらの液晶パネル 5 R、5 G、5 B の電極には、液晶駆動部 (不図示) を介して駆動電圧が印加される。反射光 (S 偏光波) は、ダイクロイックミラー 3、4 により R G B 3 色に色分解し、液晶パネル 5 R、5 G、5 B のパネル面へそれぞれ照射する。

【0004】液晶パネル 5 R、5 G、5 B 面では、ランダム状態では、液晶分子の軸が無秩序に配向することにより、入射光が拡散反射される。このとき、微視的な入射位置によって入射光を反射する深さや向きが一定しないため、拡散光の波面は複雑に混合し無偏光状態となる。一方、整列状態では、液晶分子の軸がパネル面に垂直に配向することにより、S 偏光をそのまま透過する。このように透過した S 偏光は、各液晶パネル 5 R、5 G、5 B の裏面側において一様に鏡面反射されるため、S 偏光状態を保った反射光となる。このようにして、それぞれの色光の空間光変調素子 5 R、5 G、5 B で映像信号によって (S + P) 偏光光に変調される。

【0005】その後、再びダイクロイックミラー 3、4、偏光ビームスプリッタ 2 と順に進みながら 3 色光が合成され、その合成光の内の P 偏光光のみが投写レンズ 6 を通過してスクリーンに映出される構成である。また、光源 1 から出射され、偏光ビームスプリッタ 2 で 2 分されたうちの直進光 (P 偏光波) は、有効利用される事はなく、機器内でそのエネルギーが熱の形で吸収される。

【0006】一方、音声 (音響) は、プロジェクタ筐体 60 内に入力された音声信号 61 a を内部アンプ 61 で増幅しスピーカ 62 から出力する方式が一般的である。また、外部に出力する場合は増幅された音声信号 61 b を直接出力したり、または音声変調回路 63 などを通じてケーブル 71 により外部アンプ 70 に出力している。

【0007】また、プロジェクタを外部から制御するには、通常はケーブル 81 を介してパソコン 80 を接続し使用する。この制御信号は、プロジェクタ筐体 60 内の電気データトランシーバ 64 と、制御を司る MPU (マイクロプロセッサユニット) 65 など構成された電気回路で行われている。

【0008】

【発明が解決しようとする課題】上記したように、従来の液晶プロジェクタでは、光源から出力される白色光は、最初に偏光ビームスプリッタで 2 分される反射光 (S 偏光波) のみが空間光変調素子で映像信号によって

変調され投影に寄与する。しかし、直進光 (P 偏光波) は投影には寄与せずに廃棄されてしまう。この様にプロジェクタ内には光源から出射光が十分に使われずに、余剰光が機器内に満ちあふれているにも関わらず従来は他に有効利用されず、内部で熱に変換してしまうという無駄がある。また、この熱量は相当な量で、取り除く為に大がかりな冷却ファンが (複数個) 必要である。

【0009】次にプロジェクタは様々な情報を入出力する機器であるが、その伝送手段は電気信号によるものであり、ケーブルを介して行われているために不要な信号を電波という形で放出したり、また逆に電気雑音を受けたりする要因になっていた。また従来、プロジェクタを遠隔制御するリモコンは他のリモコンと同様に電力供給源として乾電池が使用されており、リモコンに乾電池収納用の無駄なスペースと、乾電池交換の手間、さらに維持費が必要である。

【0010】本発明はこのような従来の問題点を鑑みてなされたもので、光源から出た白色光を偏光ビームスプリッタ通過後に廃棄していた直進光 (P 偏光波) 又は反射光 (S 偏光波)、を有効利用することでプロジェクタと外部機器との情報のやり取りをこれらの光を利用して行うことを目指す。また、太陽電池をリモコンに装備する事でそれらの光の一部を利用してリモコンの電力源として利用し、リモコンに必要であった乾電池の入れ替えなどのメンテナンスを無くす事を目的とする。

【0011】

【課題を解決するための手段】上記問題点の解決のために本発明では、光源 1 から出た白色光が偏光ビームスプリッタ 2 によって 2 分された光のうち、直進光 (P 偏光波; 映像に寄与しない光) の光路上にミラー 8 を配置し、そこで反射された P 偏光光を光変調素子 (27、29) で音声信号やデータ信号で変調し出力する構成とした。またプロジェクタが音声信号やデータ信号を受信する場合は、無変調の偏光光を送信したい機器に出射し、その機器で音声信号やデータ信号で変調して送り返し、その信号をプロジェクタに装備された受光素子 28 で受信する。

【0012】本発明の構成により送受信をプロジェクタ内で発生する投影に寄与しない余剰光で実現できる構成とした。さらに余剰光の内、通信に利用しない偏光光の一部か、また余剰光を通信に利用しない場合には、太陽電池を装備したリモコンをプロジェクタに装着して、プロジェクタの内部からそれらの光を受光して発電し、リモコン内に蓄えて電力源として利用する。

【0013】

【発明の実施の形態】以下、本発明の実施形態を図に基づいて詳細に説明する。図 1 は、本発明の実施形態を示すブロック図である。光源 1 から出射された白色光の光路上に偏光ビームスプリッタ 2 が配置されており、白色光はこの偏光ビームスプリッタ 2 により反射光 (S 偏光

26を通過する事で光ファイバに入力するのに最適なスポットに凝縮され、プロジェクタ筐体10(図1)外に送出される。この音声信号はPWM変調されてもいいし、完全デジタル信号として送信されてもよい。一方、ダイクロイックミラー21(図2)を直進した青色光を含まないP偏光光は、波長の長い赤色光を反射するダイクロイックミラー22で分光され、ここで反射したP偏光の赤色光Rpはミラー25a、25bで反射した後にP偏光のため偏光ビームスプリッタ24を通過する。その後、ダイクロイックミラー23で反射した後、集光光学レンズ群26で光ファイバに入力するのに最適なスポットに凝縮され、無変調の赤色のP偏光光Rpとして送出される。

【0025】このRp光は、図1で示した送受信用光電変換モジュール50でパソコン80からの信号で変調される。そして、信号成分を含んだS偏光光Rsと送出した光がそのまま反射してきたRpの両方を含んだ反射光(Rp+Rs)として再び光ファイバ90を通過して、プロジェクタ筐体10内の光伝送光学ブロック20に送り返される。

【0026】この光は、集光光学レンズ群26(図2)、ダイクロイックミラー23と逆行して、偏光ビームスプリッタ24に到達する。この偏光ビームスプリッタ24で信号成分の赤色のS偏光光Rsだけが反射して、受光素子28に導かれ、受光素子28で電気信号に変換される。前述したように、この信号は図1の波形整形回路13を経由してMPU14に送られる。こうして、パソコン80からの信号をプロジェクタ筐体10の内部に取り込むことができる。また、偏光ビームスプリッタ24を直進した赤色のP偏光光は映像光や他の光伝送光に危害を与えることなく光源に戻される。

【0027】ダイクロイックミラー22を直進した緑色のP偏光光Gpは透過型液晶パネルなどの光変調素子29で変調される。光変調素子29は、前述したように、MPU14からのデジタル信号によって液晶駆動回路12を制御することで、P偏光光Gpは、信号成分であるS偏光光を含んだ緑色光(Gp+Gs)となる。この光は、ダイクロイックミラー23を直進した後、集光光学レンズ群26(図2)で光ファイバに入力するのに最適なスポットに凝縮され、プロジェクタ筐体10外に送出される。この変調光(Gp+Gs)は光ファイバ90の中を通過して送受信用光電変換モジュール50に光伝送される。この様に、液晶パネルやDMDなどの光変調素子を組み合わせる事によって、光をデジタル的に変調して伝送することができる。また、光伝送光学ブロック20に入力してくる光がP偏光光(S偏光光もあり得る)であるため、信号成分の光をS偏光光(P偏光光もあり得る)とすれば容易に同じ伝送系を利用できる。

【0028】以上の説明でわかるように、本発明では、双方向同時に違う信号を伝送できる為に、伝送ケーブル

を簡略化できる。また、プロジェクタ筐体10と、パソコン80や外部アンプ70などの外部機器が近傍に設置してある場合は、光ファイバ90などの伝送ケーブルを使用しないで、光を空間で伝達する構成も考えられる。

【0029】図3は、プロジェクタ筐体10の光送出口に、太陽電池を組み込んだリモコンを装着した図である。リモコン30は太陽電池31を備えた構造になっており、太陽電池31で発電された電力は、リモコン30内の小さな2次電池32に蓄えられ、内部の電気回路に供給される。プロジェクタ筐体10の光伝送に使わない光送出口に容易に装着できる固定部材33を備え、装着時は光が漏れない構造になっている。

【0030】

【発明の効果】以上のように、本発明によれば従来有効利用される事はなく、機器内でそのエネルギーが熱の形で吸収される余剰光(S偏光光もしくはP偏光光)を外部機器との光伝送光として使用したり、太陽電池付きリモコンの発電光として使用する事により、光源光を有効に利用できる。すなわち、余剰の偏光光を透過型液晶パネルやDMDなどの光変調手段を用いることで音声信号もしくはデータ信号に変換し出力し、プロジェクタの筐体の外部から与えられる音声信号もしくはデータ信号に応じて余剰の偏光光を変調することで光信号として入力するプロジェクタが実現できる。また、このように光信号を用いることで電気信号からの電磁放射ノイズの出力、また逆に影響を受ける問題が防げる。さらに、この余剰の偏光光を太陽電池付きリモコンの発電光に利用することもできる。また内部で熱に変わっていた光が外部に放出されることで冷却ファンなどのクーリング装置を簡素化できるためにプロジェクタ筐体を小型化できる効果がある。それに伴ってさらなる省電力も実現する。また、光ケーブルを使用するために、同じ光ケーブル内を双方向同時に違う信号を伝送できる為に、伝送ケーブルを大幅に簡略化できる効果もある。

【0031】余剰光を利用しないときは、プロジェクタ筐体のコネクタに設置されたシャッターを閉じることでプロジェクタ筐体の外部に不要な光が漏れることが防げる。

【図面の簡単な説明】

【図1】本発明のプロジェクタのブロック図

【図2】光伝送光学ブロックのブロック図

【図3】本発明のプロジェクタにリモコンを装着したブロック図

【図4】受信用の光電変換モジュールのブロック図

【図5】送受信用の光電変換モジュールのブロック図

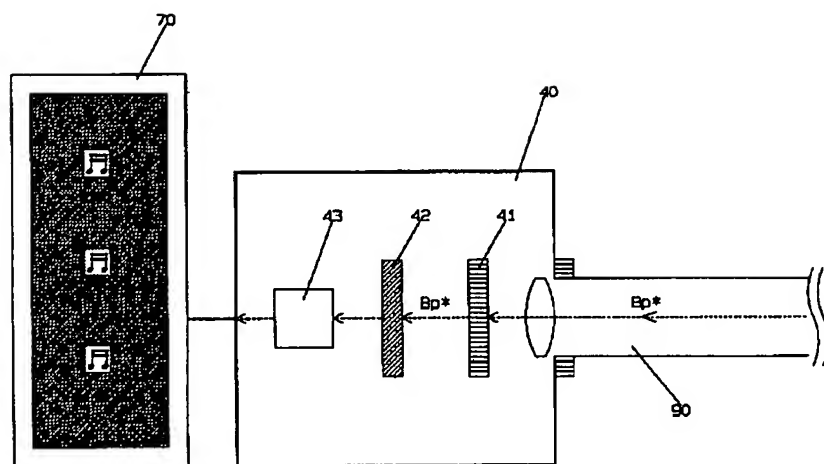
【図6】従来のプロジェクタのブロック図

【符号の説明】

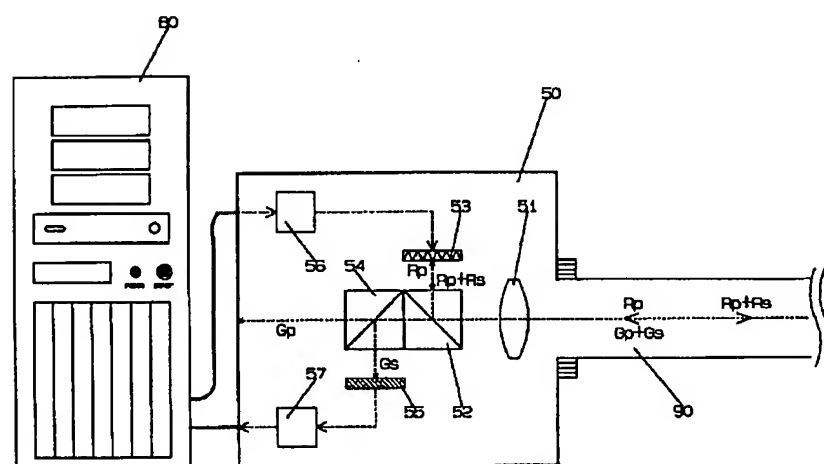
1 光源
2、24、54 偏光ビームスプリッタ

[illegible]

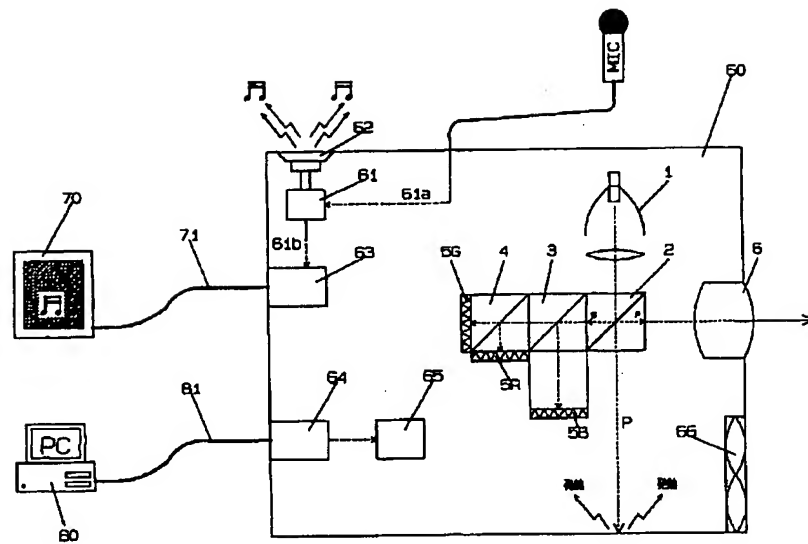
【図 4】



【図 5】



【図 6】



フロントページの続き

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CLAIMS

[Claim(s)]

[Claim 1] In the projector which has a polarization light branching means to branch the light from the light source and said light source in S polarization light and P polarization light It is arranged at the attainment place of the polarization light of the side which is not used for projection among said S polarization light which branched with said polarization light branching means, and said P polarization light. The projector characterized by having a light modulation means to modulate said polarization light according to the sound signal or data signal given from the outside of the case of said projector, and to generate modulation polarization light, and a modulation polarization optical output means to output said modulation polarization light outside.

[Claim 2] The projector carry out having a non-become irregular polarization optical output means is arranged at the attainment place of the polarization light of the side which is not used for projection among said S polarization light which branched with said polarization light branching means, and said P polarization light in the projector which has a polarization light branching means branch the light from the light source and said light source in S polarization light and P polarization light, and output said polarization light outside with no becoming irregular as the description.

[Claim 3] In the projector which has a polarization light branching means to branch the light from the light source and said light source in S polarization light and P polarization light A non-become irregular polarization optical output means to be arranged at the attainment place of the polarization light of the side which is not used for projection among said S polarization light which branched with said polarization light branching means, and said P polarization light, and to output said polarization light outside with no becoming irregular, The polarization light outputted outside by the sound signal or data signal given by an external device etc. with no becoming [said] irregular receives a modulation. A modulation polarization light input means to input modulated S polarization light or modulated P polarization light into said projector, The projector characterized by having the photo detector which changes said modulated S polarization light which was inputted with said modulation polarization light input means, or said modulated P polarization light into an electrical signal.

[Claim 4] In the projector which has a polarization light branching means to branch the light from the light source and said light source in S polarization light and P polarization light A color-separation means for it to be arranged at the attainment place of the polarization light of the side which is not used for projection among said S polarization light which branched with said polarization light branching means, and said P polarization light, and to divide said polarization light into each colored light of red, green, and blue, The projector characterized by having the light modulation means which modulates one of said each colored light according to the sound signal or data signal given from the outside, and is made into modulation polarization light, and a modulation polarization optical output means to output said modulation polarization light to the exterior of the case of said projector.

[Claim 5] It is the projector characterized by said non-become irregular polarization optical output means and said modulation polarization light input means consisting of common members in a projector according to claim 3.

[Claim 6] The projector characterized by consisting of optical transmission members with said common member in a projector according to claim 5.

[Claim 7] It is the projector characterized by said optical transmission member having an optical fiber in a projector according to claim 6.

[Claim 8] It is the projector characterized by said polarization light branching means having a polarization beam splitter in a projector given in any of claim 1 to claim 4.

[Claim 9] It is the projector characterized by said light modulation means having a digital micro mirror device in a projector according to claim 1 or 4.

[Claim 10] It is the projector characterized by said light modulation means having a transparency mold liquid crystal panel in a projector according to claim 1 or 4.

[Claim 11] It is the projector characterized by said color-separation means having a dichroic mirror in a projector according to claim 4.

[Claim 12] It is the projector which said projector was equipped with the remote controller which operates said projector in the projector according to claim 2, said remote controller was equipped with a means to accumulate the power produced from a solar battery and said solar battery, and said solar battery made said output light charge light, and was characterized by accumulating power in said are recording means.

[Claim 13] It is the projector characterized by equipping the location of the outlet of said output light which opened said remote controller in the case of said projector in the projector according to claim 12 by the removable holddown member.

[Claim 14] It is the projector characterized by having the shutter said non-become irregular polarization optical output means does not reveal light by saying a shutter from the case of said projector in a projector according to claim 2 or 3.

[Claim 15] It is the projector characterized by having the shutter said modulation polarization optical output means does not reveal light by saying a shutter from the case of said projector in a projector according to claim 1 or 4.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a projector.

[0002]

[Description of the Prior Art] Conventionally, light is irradiated from the light source at a liquid crystal panel, and the liquid crystal projector of the reflective mold which projects the reflected light from a liquid crystal panel on a screen is known. The configuration of the conventional projector is shown in drawing 6. In drawing 6, a polarization beam splitter 2 is arranged through the illumination-light study system 9 at the direction of radiation of the light source 1. Thereby, the white light is made into two linearly polarized light, i.e., P polarization wave (rectilinear-propagation light) and S polarization wave (reflected light), light and the polarization direction cross at right angles mutually for 2 minutes. Incidentally, according to [written by Kozo Ishiguro "optics", S of S polarization and P polarization and P are the initials of Senkrecht (perpendicular) and Parallel (parallel).

[0003] Dichroic mirrors 3 and 4 are arranged at the attainment place of the reflected light (S polarization wave) at each colored light of red, green, and blue. In the reflective direction of the blue component (B) in a dichroic mirror 3, liquid crystal panel 5B for B is arranged. in the transparency direction of a dichroic mirror 3, liquid crystal panel 5R for R arranges in the reflective direction of the red component (R) in a dichroic mirror 4 -- having -- moreover -- the transparency direction of dichroic mirrors 3 and 4 -- the object for G of a green component (G) -- liquid crystal panel 5G are arranged. These liquid crystal panels 5R, 5G, and 5B Driver voltage is impressed to an electrode through a liquid crystal mechanical component (un-illustrating). The color is separated into RGB3 color with dichroic mirrors 3 and 4, and the reflected light (S polarization wave) is irradiated, respectively to the panel side of liquid crystal panels 5R, 5G, and 5B.

[0004] At liquid crystal panels 5R and 5G and 5B page, in the random condition, when the shaft of a liquid crystal molecule carries out orientation disorderly, diffuse reflection of the incident light is carried out. Since the depth or the sense which reflect incident light with a microscopic incidence location are not fixed at this time, it mixes intricately and the wave front of the diffused light will be in the condition of not polarizing. When the shaft of a liquid crystal molecule carries out orientation at right angles to a panel side in the state of alignment on the other hand, S polarization is penetrated as it is. Thus, since specular reflection of the transmitted S polarization is uniformly carried out to the rear-face side of each liquid crystal panels 5R, 5G, and 5B, it turns into the reflected light which maintained S polarization condition. Thus, polarization (S+P) light becomes irregular with a video signal by the space light modulation elements 5R, 5G, and 5B of each colored light.

[0005] Then, it is the configuration which 3 colored light is compounded progressing to dichroic mirrors 3 and 4, a polarization beam splitter 2, and order again, only P polarization light of the synthetic light passes the projection lens 6, and a screen projects. Moreover, the rectilinear-propagation light (P polarization wave) of the inside which outgoing radiation was carried out from the light source 1, and was carried out by the polarization beam splitter 2 for 2 minutes is not used effectively, and the energy is

absorbed in the form of heat within a device.

[0006] On the other hand, the method of voice (sound) which amplifies sound signal 61a inputted in the projector case 60 with the internal amplifier 61, and is outputted from a loudspeaker 62 is common. Moreover, when outputting outside, the direct output of the amplified sound signal 61b is carried out, or it is outputted to the external amplifier 70 with the cable 71 through the voice modulation circuit 63 etc.

[0007] Moreover, in order to control a projector from the outside, it is usually used through a cable 81, connecting a personal computer 80. This control signal is performed in the electrical circuit which consisted of an electric data transceiver 64 in the projector case 60, MPU (microprocessor unit) 65 which manages control.

[0008]

[Problem(s) to be Solved by the Invention] As described above, in the conventional liquid crystal projector, it becomes irregular with a video signal by the space light modulation element, and only the reflected light (S polarization wave) first carried out by the polarization beam splitter for 2 minutes contributes the white light outputted from the light source to projection. However, rectilinear-propagation light (P polarization wave) will be discarded, without contributing to projection. Thus, without fully using outgoing radiation light from the light source in a projector, in spite of having filled surplus light in the device, it is not conventionally used effectively for others but there is futility of changing into heat inside. Moreover, this heating value is a considerable amount, and in order to remove, a large-scale cooling fan is required for it (plurality).

[0009] Next, although the projector was a device which outputs and inputs various information, the transmission means is based on an electrical signal, and since it was carried out through the cable, it had become the factor which emits an unnecessary signal in the form of an electric wave, and receives electrical noise conversely. Moreover, conventionally, the dry cell is used as a power source of supply like other remote control, and the remote control which carries out remote control of the projector needs a sustaining cost for the time and effort of the useless tooth space for dry-cell receipt and dry-cell exchange with remote control, and a pan.

[0010] This invention was made in view of such a conventional trouble, and it aims at performing the exchange of the information on a projector and an external instrument using such light by using effectively the rectilinear-propagation light (P polarization wave) or the reflected light (S polarization wave) which had discarded the white light which came out of the light source after polarization beam splitter passage. Moreover, it uses as a power source of remote control by equipping remote control with a solar battery using a part of those light, and aims at losing the maintenance of exchange of the dry cell which was required for remote control etc.
 [0011]

[Means for Solving the Problem] For solution of the above-mentioned trouble, among the light to which the white light which came out of the light source 1 in this invention was carried out by the polarization beam splitter 2 for 2 minutes, the mirror 8 has been arranged on the optical path of rectilinear-propagation light (P polarization wave; light which does not contribute to an image), and it considered as the configuration which modulates and outputs P polarization light reflected there with a sound signal or a data signal by the light modulation element (27 29). Moreover, when a projector receives a sound signal and a data signal, outgoing radiation is carried out to a device to transmit a polarization light non-become irregular, and it becomes irregular and returns with a sound signal or a data signal by the device, and receives by the photo detector 28 equipped with the signal by the projector.

[0012] It considered as the configuration realizable with the surplus light which does not contribute to the projection which generates transmission and reception within a projector by the configuration of this invention. A part of polarization light which furthermore is not used for a communication link among surplus light, and in not using surplus light for a communication link again, a projector is equipped with remote control equipped with a solar battery, those light is received and generated from the interior of a projector, and it stores in remote control, and uses as a power source.

[0013]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained to a detail based on drawing. Drawing 1 is the block diagram showing the operation gestalt of this invention. The

polarization beam splitter 2 is arranged from the light source 1 on the optical path of the white light by which outgoing radiation was carried out, and the white light is divided into the reflected light (S polarization light) and the transmitted light (P polarization light) by this polarization beam splitter 2. [0014] The dichroic mirrors 3 and 4 which divide light into each colored light of red, green, and blue are arranged at the optical path of the reflected light (S polarization light), as for S polarization light, red is reflected with a dichroic mirror 4 by reflecting blue with a dichroic mirror 3, and each colored light goes to the reflective mold space light modulation elements 5B and 5R. Moreover, the green colored light which penetrated dichroic mirrors 3 and 4 goes to reflective mold space light modulation element 5G. [0015] In each reflective mold space light modulation element (5R, 5G, 5B), polarization (S+P) light becomes irregular with a video signal, and each colored light is reflected. Then, colored light is compounded progressing dichroic mirrors 4 and 3 and a polarization beam splitter 2 in order again, S polarization light is reflected by the polarization beam splitter 2, and only P polarization light passes the projection lens 6, and projects on a screen.

[0016] It is reflected by the mirror 8 on an optical path, and the rectilinear-propagation light (P polarization light) which outgoing radiation was carried out from the light source 1, and, on the other hand, penetrated the polarization beam splitter 2 is led to the optical transmission optical block 20. This light is not conventionally used as a surplus light, but although it was [only being changed into heat, and], by this invention, this light is used effectively so that it may state in detail below. Surplus light is used when outputting voice (sound) outside. Amplified sound signal 61b is inputted into the optical transmission optical block 20 (drawing 2) through the DMD drive circuit 11. Although stated in detail later, light modulation of a part of light (rectilinear-propagation light which penetrated said polarization beam splitter 2) inputted into the optical transmission optical block 20 here is used and carried out, and it sends out to the exterior of the projector case 10.

[0017] The sent-out lightwave signal passes along the inside of the optical fiber 90 connected to the projector case 10 by the connector 91, and optical transmission is carried out to the photo-electric-conversion module 40 for reception. Drawing 4 is drawing having shown the photo-electric-conversion module 40 for reception. After modulation light Bp* transmitted in the optical fiber 90 improves SN by passing the polarizing filter 41 which passes only P polarization light and it carries out photo electric conversion by the photo detector 42, it has composition which outputs an electrical signal through the waveform shaping circuit 43. However, even if there is no polarizing filter 41, the photo-electric-conversion module 40 for this reception is realizable.

[0018] The sound signal changed into the electrical signal by the photo-electric-conversion module 40 for reception is passed to the conventional external amplifier 70 (drawing 1). When outputting voice (sound) from the loudspeaker 62 installed in the projector case 10, surplus light does not use. Inputted sound signal 61a is amplified with the internal amplifier 61, and it outputs from a loudspeaker 62.

[0019] Next, how to transmit and receive within and without case 10 is explained using surplus light. When sending a signal to the external personal computer 80 from MPU14 in the projector case 10, the electrical signal is inputted into the optical transmission optical block 20 through the liquid crystal drive circuit 12. The light modulated here passes along the inside of the optical fiber 90 connected to the projector case 10 by the connector 91, and optical transmission is carried out to the photo-electric-conversion module 50 for transmission and reception.

[0020] Drawing 5 is drawing having shown the photo-electric-conversion module for transmission and reception. It is expanded to a suitable spot light with the lens 51 arranged in the case of the photo-electric-conversion module 50 for transmission and reception, and reflects with the dichroic mirror 52 which reflects red light with long wavelength, and red P polarization light Rp which has passed the optical fiber 90 is modulated in S polarization light Rs of the red which is a signal component in the light modulation elements 53, such as a reflective mold liquid crystal panel. This light modulation element 53 is driven in the liquid crystal drive circuit 56 based on the signal of a personal computer etc. The reflected light (Rp+Rs) containing a signal component passes with a dichroic mirror 52 and a lens 51, passes along an optical fiber 90 again, and is transmitted to the optical transmission optical block 20 in the projector case 10. The green light (Gp+Gs) which, on the other hand, contained the signal

component which has passed the optical fiber 90 is expanded to a suitable spot light with a lens 51, goes a dichroic mirror 52 straight on, and reaches a polarization beam splitter 54. Only a signal component Gs reflects here and it is led to a photo detector 55. After photo electric conversion is carried out by the photo detector 55, a signal is transmitted by external instruments, such as a personal computer, through a waveform shaping circuit 57.

[0021] The data signal changed into the electrical signal by the photo-electric-conversion module 50 for transmission and reception is transmitted to a personal computer 80. Conversely, after light modulation of the signal from a personal computer 80 was carried out by the photo-electric-conversion module 50 for transmission and reception, it is led to the optical transmission optical block 20 through the same optical fiber 90 and photo electric conversion is carried out here, it is transmitted to MPU14 through a waveform shaping circuit 13.

[0022] Thus, although the light which does not contribute to projection image light was throwing away conventionally, light source light can be used without futility by using as a means of optical transmission. Furthermore, since the light changed into heat inside is outputted out of the projector case 10, the small cooling fan 7 can be used instead of a large-sized cooling fan 66 (drawing 6) like before. Moreover, when not using surplus light, it can prevent leaking an unnecessary light to the exterior of the projector case 10 by closing the shutter 92 installed in the connector 91.

[0023] Drawing 2 is drawing which explained an example of the optical transmission optical block 20 to the detail. P polarization light which was explained by drawing 1 and which was reflected by the mirror 8 like is led to the optical transmission optical block 20. Although this light is P polarization light, it contains all the wavelength of R, G, and B. Then, blue P polarization light Bp which the spectrum was carried out and was reflected here with the dichroic mirror 21 (drawing 2) which reflects blue glow with short wavelength is led to DMD(digital micro mirror device) 27. The former ***** DMD drive circuit 11 is driving this DMD27 (drawing 2), and reflecting Bp light at the condensing optical lens group 26 side, or reflecting in the other directions, and light modulation of it is carried out to sound signal 61b amplified with the internal amplifier 61 shown in drawing 1 in digital one, and it is made it at Bp*.

[0024] Modulated optical Bp* is condensed by the optimal spot for inputting into an optical fiber by passing the condensing optical lens group 26, and is sent out out of the projector case 10 (drawing 1). An PWM modulation may be carried out and this sound signal may be transmitted as a perfect digital signal. The red light Rp of P polarization which the spectrum of the P polarization light which, on the other hand, does not contain the blue glow which went the dichroic mirror 21 (drawing 2) straight on was carried out with the dichroic mirror 22 which reflects red light with long wavelength, and was reflected here passes a polarization beam splitter 24 for P polarization, after reflecting by Mirrors 25a and 25b. Then, after reflecting with a dichroic mirror 23, by the condensing optical lens group 26, the optimal spot for inputting into an optical fiber condenses, and it is sent out as a P polarization light Rp of the red non-become irregular.

[0025] This Rp light is modulated by the signal from a personal computer 80 with the photo-electric-conversion module 50 for transmission and reception shown by drawing 1 . And S polarization light Rs containing a signal component and the sent-out light pass along an optical fiber 90 again as the reflected light (Rp+Rs) containing both Rp(s) reflected as it is, and is returned to the optical transmission optical block 20 in the projector case 10.

[0026] This light goes back with the condensing optical lens group 26 (drawing 2) and a dichroic mirror 23, and reaches a polarization beam splitter 24. Only S polarization light Rs of the red of a signal component reflects by this polarization beam splitter 24, and it is led to a photo detector 28, and is changed into an electrical signal by the photo detector 28. As mentioned above, this signal is sent to MPU14 via the waveform shaping circuit 13 of drawing 1 . In this way, the signal from a personal computer 80 can be incorporated inside the projector case 10. Moreover, P polarization light of the red which went the polarization beam splitter 24 straight on is returned to the light source, without doing harm to image light or other optical transmission light.

[0027] Green P polarization light Gp which went the dichroic mirror 22 straight on is modulated by the

light modulation elements 29, such as a transparency mold liquid crystal panel. As the light modulation element 29 was mentioned above, it is controlling the liquid crystal drive circuit 12 by the digital signal from MPU14, and P polarization light Gp turns into green light (Gp+Gs) containing S polarization light which is a signal component. After this light goes a dichroic mirror 23 straight on, it is condensed by the optimal spot for inputting into an optical fiber by the condensing optical lens group 26 (drawing 2), and is sent out of the projector case 10. Optical transmission of this modulation light (Gp+Gs) is carried out [be / it / under / of an optical fiber 90 / passing] to the photo-electric-conversion module 50 for transmission and reception. Thus, by combining light modulation elements, such as a liquid crystal panel and DMD, it can become irregular in digital one and light can be transmitted. since [moreover,] the light inputted into the optical transmission optical block 20 is P polarization light (there may also be S polarization light) -- the light of a signal component -- S polarization light (there may also be P polarization light) -- then, the same transmission system can be used easily.

[0028] Since the signal which is different in bidirectional coincidence can be transmitted, by this invention, a transmission medium can be simplified, so that it may understand by the above explanation. Moreover, the configuration which transmits light in space is also considered without using transmission media, such as an optical fiber 90, when external instruments, such as the projector case 10, and a personal computer 80, the external amplifier 70, are installed in near.

[0029] Drawing 3 is drawing equipped with the remote control which built the solar battery into optical sending-out opening of the projector case 10. The power which remote control 30 has structure equipped with the solar battery 31, and was generated with the solar battery 31 is stored in the small rechargeable battery 32 in remote control 30, and is supplied to an internal electrical circuit. It has the holddown member 33 with which optical sending-out opening which is not used for the optical transmission of the projector case 10 can be equipped easily, and has the structure where light does not leak, at the time of wearing.

[0030]

[Effect of the Invention] As mentioned above, according to this invention, light source light can be effectively used by using the surplus light (S polarization light or P polarization light) by which it is not conventionally used effectively and the energy is absorbed in the form of heat within a device as an optical transmission light with an external instrument, or using it as a generation-of-electrical-energy light of remote control with a solar battery. That is, an excessive polarization light is changed and outputted to a sound signal or a data signal by using light modulation means, such as a transparency mold liquid crystal panel and DMD, and the projector inputted as a lightwave signal can be realized in modulating an excessive polarization light according to the sound signal or data signal given from the outside of the case of a projector. Moreover, the output of the electromagnetic radiation noise from an electrical signal and the problem influenced conversely can be prevented by using a lightwave signal in this way. Furthermore, the polarization light of this surplus can also be used for the generation-of-electrical-energy light of remote control with a solar battery. Moreover, since cooling equipments, such as a cooling fan, can be simplified by the light which had changed to heat inside being emitted outside, there is effectiveness which can miniaturize a projector case. Further power saving is also realized in connection with it. Moreover, since the signal which is different in bidirectional coincidence in the inside of the same optical cable can be transmitted in order to use an optical cable, there is effectiveness which can simplify a transmission medium sharply.

[0031] When not using surplus light, it can prevent leaking an unnecessary light to the exterior of a projector case by closing the shutter installed in the connector of a projector case.

[Translation done.]

* NOTICES *

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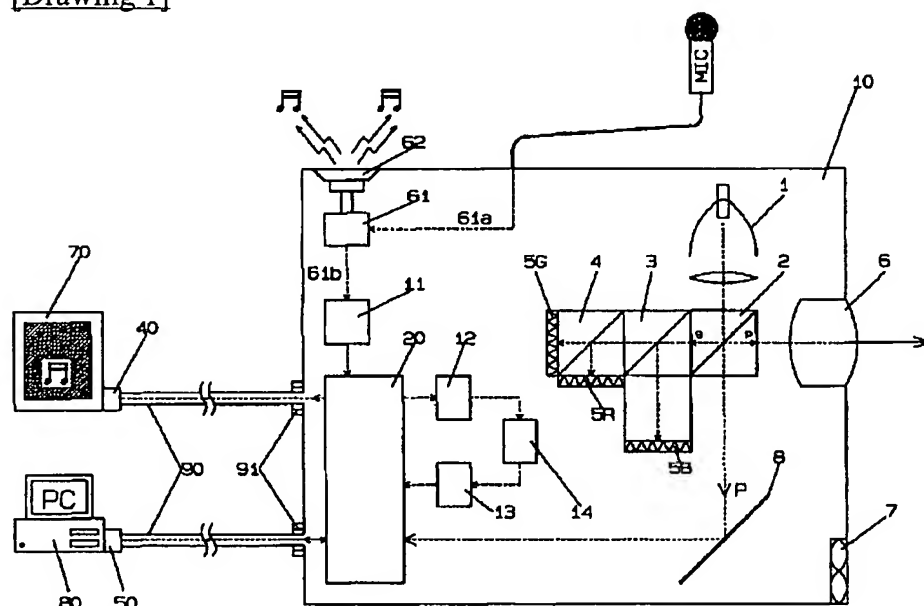
1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. **** shows the word which can not be translated.

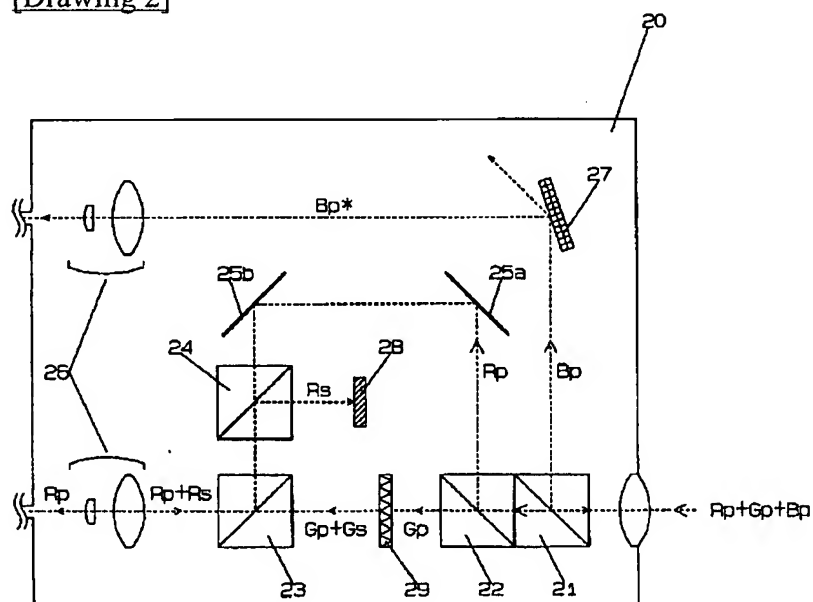
3. In the drawings, any words are not translated.

DRAWINGS

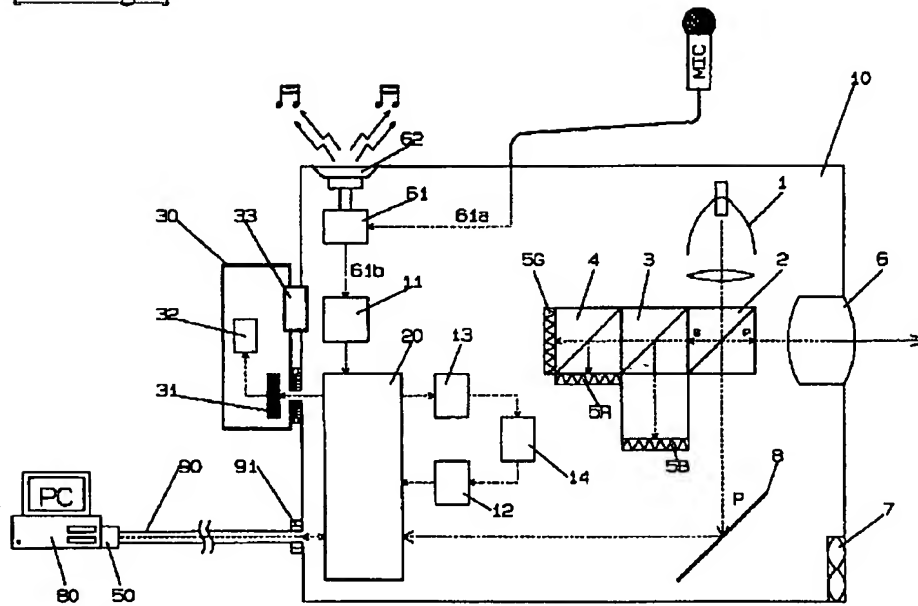
[Drawing 1]



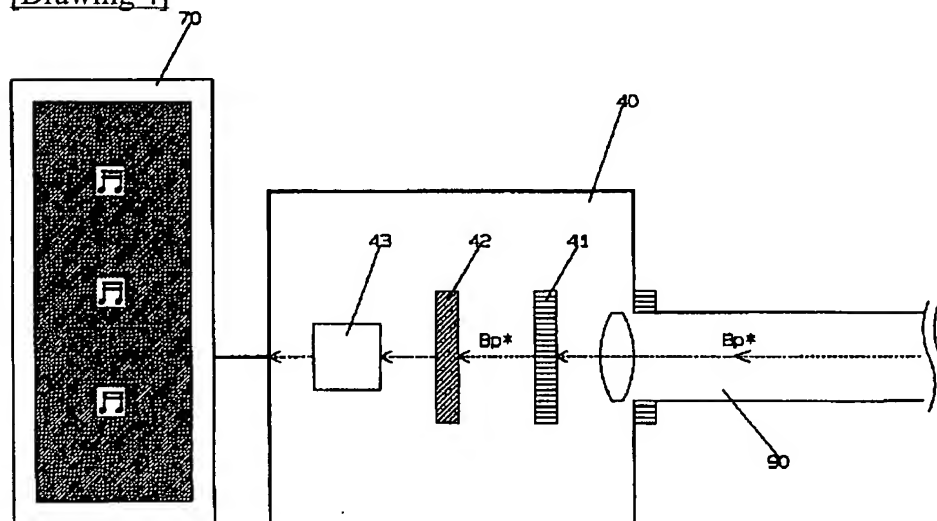
[Drawing 2]



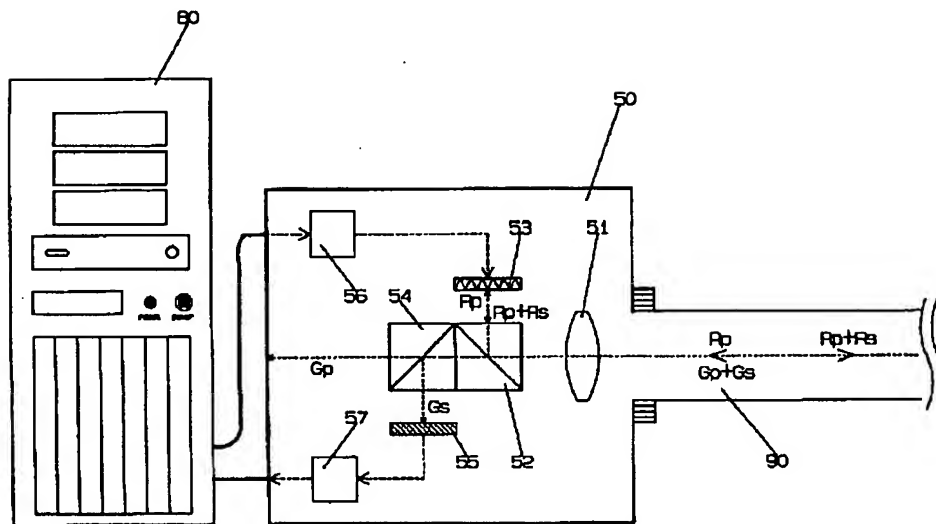
[Drawing 3]



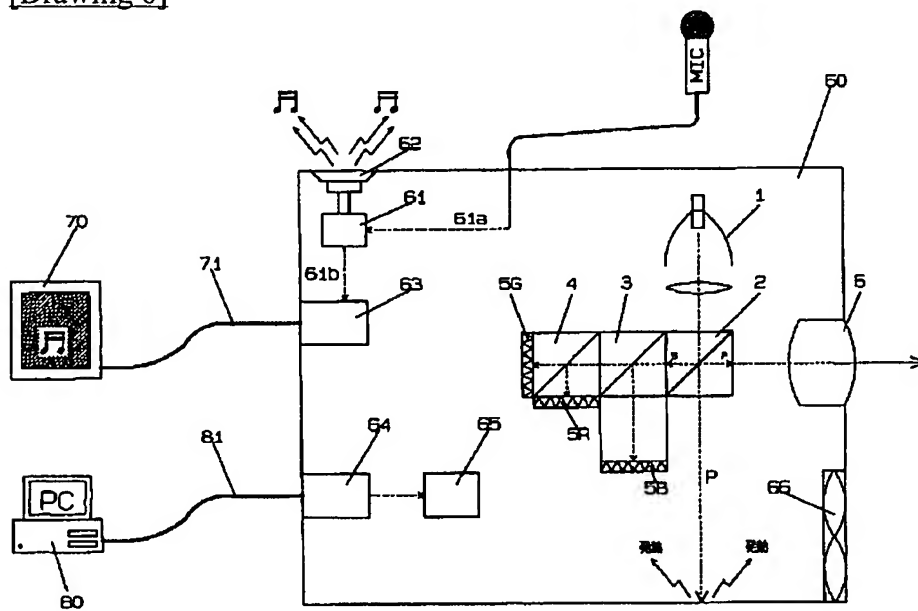
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]